California Integrated Waste Management Board
Permitting & Enforcement
Closed Illegal & Abandoned Site Investigation Unit (CIA)

Gas Investigation Work Plan (Final)

14th Avenue Landfill

Power Inn Road & 14th Avenue - Sacramento, CA

July 2002

Prepared By:
California Integrated Waste Management Board
P.O. Box 4025
(1001 "I" Street)
Sacramento, California 95812-4025

SWIS # 34-AA-0015

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FIGURES & EXHIBITS

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1. INTRODUCTION

The California Integrated Waste Management Board (CIWMB), Closed Illegal and Abandoned Site Unit (CIA) investigates solid waste disposal sites and provides site data and documentation to quantify requirements for both enforcement and potential clean-up activities by the CIWMB Solid Waste Cleanup Program (AB 2136). Depending on the types of wastes at the site, landfill gas sampling may be necessary to determine gas concentrations and lateral gas migration for the purpose of scoping enforcement and remediation work or referral to the local Air Quality Management District (AQMD).

The CIA unit, at the request of the Sacramento County Local Enforcement Agency, has prepared this work plan for a gas investigation at the 14th Avenue Landfill. The purpose of this investigation is to assess site conditions and the potential for gas migration from landfilled waste.

Walker and Donant operated the 14th Avenue Landfill, also known as Ramona Landfill, from 1968 to 1975 under existing waste discharge requirement WDR Order No. 71-204. The facility consisted of two separated unlined landfills on the east and west halves of the site, respectively. After landfilling operations ceased in 1975, the site was subdivided into parcel lots and each lot was sold. The parcels corresponding to the East Pit Landfill area are (or were) previously owned by the above-named individuals.

1.1 SITE LOCATION AND DESCRIPTION

The site is located north of 14th Avenue and west of Power Inn Road in the eastern portion of the City of Sacramento (Figure 1). The site appears on the USGS 7.5-Minute Series Topographic Map of the Sacramento East Quadrangle (USGS, 1980) in Township 8 North, Range 5 East, section 15, Tract Q and R (Mountain Diablo Base Meridian), and appears in the Sacramento County Assessors Map Book 79 on Page 30 (Parcel Nos. 1, 6-9, 12, 14-17) and Book 15 on Page 31 (Parcel Nos. 24, 28, 29, 31-34). The site includes two former gravel pits separated by the Southern Pacific Railroad tracks. The western portion of the site (west pit) occupies approximately 12 acres and the eastern portion of the site (east pit) is approximately 15 acres.

East Pit

West Pit

Site Boundaries

N

Not to Scale

Figure 1

California Integrated Waste Management Board Permitting & Enforcement (Closed Illegal and Abandoned Sites Unit)	
Prepared By: AMC	**Site Location Map** 14th Avenue Landfill Sacramento, CA
Date: 7/15/2002	

1.2 SITE BACKGROUND AND HISTORY

According to records on file with the RWQCB, Sacramento County Environmental Health Department (Local Enforcement Agency LEA), and our files at the California Integrated Waste Management Board (CIWMB), the following is the history of the 14th Avenue landfill:

1962

The McGillivray Construction Company originally used the site as an open-pit gravel mine until June of 1962. The base of the open-pit gravel mining operations (approximately 16 to 18 ft below MSL) coincided roughly with the base of a cobbly gravel zone, approximately 57 ft below previous surface elevations.

1968/1970

Walker and Donant converted the open gravel-mine pits to a landfill sometime between 1968 and 1970, following final excavation of the northeast portion of the east pit. An early guide to operations, prepared by the Sacramento City Planning Commission and dated December 8, 1970, provided guidelines regarding refuse lift thickness control, operation times, and final cover requirements, including requiring a minimum 4-ft-thick final cover compacted and graded to prevent ponding. The landfill does not contain base liners or a containment system, leachate collection system, gas collection systems, nor were these systems required while the landfill was in operation. The disposal site of approximately 23 acres in size consisted of east and west areas separated by the Pacific Railroad Track.

The 1970 Waste Discharge Requirements (WDRs) for the Walker and Donant (14th Avenue Landfill) operation limited discharge at the landfill to Class III materials, and provided that any Class II materials be preceded by the sealing of the pit walls and floor with a minimum of 3 ft of clay.

1970 – 1977

Refuse disposal operations began in the west pit. Disposal operations switched to the east pit in 1973, following filling of the west pit to near surface grade. Walker and Donant requested authorization to temporarily return to refuse disposal in the west pit and the Sacramento County Planning Commission provided authorization in 1973. Following final filling of the west pit, operations returned to the east pit. Landfill operations

continued until February 27, 1976, at which time the landfill was closed by Walker and Donant due to completed filling of both pits. Subdivision of a portion of the property began in 1977.

1977 – 1992

Regulatory requirements associated with subdivision of one of the parcels overlying the west pit of the landfill were promulgated by the City of Sacramento in 1985. It was known that landfill gas was migrating from the landfill into the structures in concentrations exceeding the LEL. Hence, the landowner (14th Avenue Associates, Inc.) was required to measure and monitor methane gas concentrations, to construct and monitor a groundwater monitoring well, and to cover the property with a low-permeability material.

Field Engineering Associates (FEA) of Sacramento constructed one dual-completion gas-monitoring well (D48) just beyond the southern margin of the west pit of the landfill. FEA and subsequently Koelzer Engineering Services (KES) also constructed and monitored a series of gas monitoring wells inside and outside the landfill to assess the nature and extent of migration of landfill gases.

Terrestrial Technologies, Inc. of Davis, CA, installed three groundwater-monitoring wells at the K & M Industries site (3562 Ramona Ave.) at the northern boundary of the former landfill, in October of 1989. Collection and analysis of soil and groundwater samples indicated the presence of low concentrations of metals, and a low concentration of petroleum hydrocarbons characterized as diesel fuel in one well. Roger Foot Associates, Inc. completed a monitoring well south of the central portion of the east pit to a depth of approximately 70 ft at 7935 14th Avenue (Senco Products, Inc.) in April of 1992. Groundwater analysis from this well indicated very low concentration of metals, and volatile organic compounds were not detected above the reporting limits.

1.3 CURRENT PROPERTY OWNERSHIPS

Approximately 16 different landowners presently own the site, none of which were responsible for any aspect of the landfill operation or closure prior to cessation of the landfill activities. A list of current landowners of the site property is shown in Table 1.

The landfill in its present configuration does not meet current regulatory requirement for cover in some areas, gas control and gas monitoring on the entire site, among others. Several areas are present where storm water is ponded within the landfill area and drainage is generally poor.

Current Property Ownerships
14th Avenue Landfill/AKA Ramona Landfill

Parcel Number	Owner Name	Site Address
015 0311 024 0000	Dibella Ralph A. Trustee	7475 14th Avenue
015 0311 028 0000	Pacific Coast Building Pro	7500 San Joaquin St.
015 0311 029 0000	Ralph Dibella Revocable	7475 14th Avenue
015 0311 031 0000	Morrow William L II & Barb	7601 14th Avenue
015 0311 032 0000	Malher Family Trust	7571 14th Avenue
015 0311 033 0000	14th Avenue Associates Inc.	7551 14th Avenue
015 0311 034 0000	14th Avenue Associates Inc.	14th Ave., Sacramento 95820
079 0300 006 0000	Messner Family Trust	3562 Ramona Avenue
079 0300 009 0000	Fritsch Lee M.	7832 Ramona Avenue
079 0300 012 0000	Gabriel and Zilha Casillas F.	7851 14th Avenue
079 0300 014 0000	Sacramento Ford Tractor	3850 14th Avenue
079 0300 015 0000	Cozzitorto Michael C. Rena	3800 Power Inn Road
079 0300 016 0000	Dra Corporation Inc.	7901 14th Avenue
079 0300 017 0000	Laurelwood Investors	7935 14th Avenue
079 0300 018 0000	Ramona Holdings Llc	7832 Ramona Avenue
079 0300 019 0000	City of Sacramento	Ramona Avenue, Sac. 95826
079 0300 020 0000	City of Sacramento	Ramona Avenue, Sac. 95826
079 0300 022 0000	Sky King Inc.	7950 Ramona Avenue
079 0300 023 0000	Sky King Inc.	3600 Power Inn Road

Table 1

Source: MetroScan/Sacramento, February 08, 2002.

1.4 PREVIOUS INVESTIGATIONS

Work performed by KES at the site regarding landfill gas generation and migration included the installation of 68 gas-monitoring wells between 1985 and 1988. Most of these wells were installed around the southern and eastern perimeters of the former landfill pits; 10 wells were installed inside on site structures. Of the 58 wells located outside of on-site structures, 25 were deep-wells installed in the upper part of the gravelly sand layer at depths of approximately 15-25 feet, below ground surface (bgs). 27 wells were shallow and installed in the upper dense silty layer at depths of approximately 3-6 feet bgs. Of the 6 remaining outdoor wells, 3 were installed along the southern edge of the west pit and 3 were installed near the center of the two former pits.

Of the 68 original gas-monitoring wells, 15 were excluded from the required inspection frequency by the Local Enforcement Agency (Environmental Management Department) in 1989 because of low or non-detectable concentrations of methane gas. Wells excluded from monitoring included nearly all of the indoor wells. According to data from one of the previous site investigations performed at the site by KES in 1992, methane gas had migrated up to 30 to 60 feet into the surrounding soil from the edges of the landfill. Migration occurred during the landfill operation in 1970 and several years after until early 90's when several site investigations were performed. Although, indications are that methane gas generation has decreased, gas is still being detected at monitoring wells around the site above the LEL. See Gas Data Review Table 2.

The gas monitoring system installed at the site has been subject to several problems such as corrosion, breakage, and blockages due to time and exposure to the elements. This hinders the accuracy of gas sampling and the ability to obtain valid gas production and migration data.

1.5 LANDFILL GAS MONITORING RESULTS (1985 – 1997)

The data presented in the following table is the result of compiling several sources of information including data from previous investigations performed at the site, manual gas screening performed at the site by the Sacramento County Environmental Management Department (SCEMD), and the CIWMB. The purpose of this table is to summarize landfill gas concentrations and gas trends through time.

Gas Data Review from Monitoring Wells
(Highest Concentration Wells at the Landfill)

		Methane Concentration* (% vol.)												
Well Name	**Location**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
A3BD	Laurelwood Property				24	26	25	12			3	7		2
D2V	Delta Equipment		30	41	38	38	34	24	20		18	17.5		
E9BS	14th Ave. Associates	21	22.5	32	31	40	27.5	28		40	22	22		
F1SD	Sacramento Ford Property				21	19	18	14			16	10		
G4BS	DRA Property				60	60	37	20			18	15		
L6FD	Lukenbill Property				28	21	21				15	2		
P3BS	Pacific Coast				44	40	40	24			21			
W14BD	Wil's Materials	50	48	40	38	40	55			27	15	17.5		
Y6BD	Curtis Roofing					12	8	6			8	8	6	5
Z1BD	Cozz European Property				40	39	35	31	26	26	20	17	16	

***** Highest concentration measured within the specific year

Reference: Gas Monitoring Reports from 1985 to 1997.

Table 2

The idea is to represent a trend of the gas production by showing data only from the monitoring wells with the highest and more significant concentration of methane gas. It is important to note that more wells exist at the site and that more readings were taken from these existing wells. From Table 2 it can be concluded that enough data exists from 1988 to 1991 as well as 1994, and 1995, and only some gas data exists from 1985 to 1987 as well as 1996, and 1997. In general, for the years where data was obtained through monitoring efforts, the gas concentrations detected were found to be above the regulatory limits allowed for boundary conditions. There is no significant data about gas production for the years after 1997. However, in-situ screening performed by LEA as well as the CIWMB in 2001 and 2002 have shown concentrations of methane gas above regulatory limits in some of the probes.

1.6 PROJECT BACKGROUND

In February of 2002, the Closed Illegal and Abandoned Site Investigation Unit (CIA), was requested by the Sacramento County Local Enforcement Agency (LEA) to perform a gas investigation at the 14th Avenue Landfill aka Ramona Landfill to determine appropriate remedial measures necessary to protect public health and safety and the environment.

1.7 PROJECT SCOPE

The objective of this investigation is to obtain representative landfill gas data at the 14th Avenue Landfill. To accomplish this objective, landfill gas wells at appropriate depths and locations will need to be constructed and monitored. The landowners will implement a two-year monitoring program using the newly constructed monitoring probes. The landfill gas well locations were selected by the CIWMB to identify and evaluate the site conditions and the potential for gas migration. The CIWMB in conjunction with their environmental consultant Ninyo and Moore (N&M) will perform the following:

- Evaluate site conditions and gas migration potential,
- Advance borings to facilitate construction of landfill gas monitoring wells,
- Construct dual or triple completion landfill gas probes at appropriate depths and locations in each of the monitoring well borings,
- Collect representative gas samples,
- Evaluate and summarize gas generation data,
- Recommend gas control options (as required).

1.8 RESPONSIBLE AGENCY

The CIWMB is responsible for the gas sampling plan, performing the sampling, analyzing the laboratory results and preparing and providing the final report to the LEA for further action. The CIWMB in coordination with N&M is responsible for drilling and landfill gas probes installation. The CIWMB will also place both the sampling plan and the site investigation report in CIWMB files and update the site's Solid Waste Information System (SWIS) database.

1.9 PROJECT ORGANIZATION

CIWMB, CIA section staff will conduct the gas investigation, oversee preparation of this gas investigation work plan (which includes the sampling and analysis plan), conduct gas sampling and analysis activities, and prepare the draft and final gas investigation reports. The CIWMB's Health and Safety section will be responsible for preparing a site specific health and safety plan and monitor onsite health and safety issues. The CIWMB will use their gas sampling equipment and obtain Tedlar Bags, labels, chain-of-custody forms, and shipping containers from its environmental laboratory services contractor, ExcelChem, Inc.

The CIWMB will be responsible for determining gas sampling locations, preparing a map indicating gas monitoring well and other gas sampling locations, sample packaging and shipping, and the analytical testing program. Ninyo and Moore will provide the necessary subcontractor and associated materials, and will oversee the drilling and installing of the multi-depth gas monitoring probes. Ninyo and Moore will also provide a project engineer or geologist to log the boreholes, prepare boring logs, prepare for each well a gas monitoring well schematic, and daily field reports to the CIWMB project engineer.

2. PROJECT OBJECTIVE

2.1 DATA COLLECTION

CIWMB staff prepared Figure 3, Proposed Gas Monitoring Well Location Map and Figure 4, Sampling Location Map, indicating locations of the proposed gas monitoring wells, locations of the previously constructed gas monitoring wells, and proposed gas sampling locations. As indicated on these figures, a maximum of 9 gas monitoring wells are proposed to be constructed. The CIWMB will be conducting authoritative gas sampling at approximately 20 locations. CIWMB staff will mark in the field the locations of the 9 proposed gas-monitoring wells. N & M personnel will notify Underground Service Alert (USA) and a private utility locator for identification and location of nearby subsurface utilities. If subsurface utilities are present at or in the immediate vicinity of the proposed gas monitoring wells, the wells will then be moved, and the adjusted locations approved by CIWMB staff. N&M will provide a drilling subcontractor to:

1) Advance a maximum of 9 borings and obtain soil samples for the N&M geologist to log the borings. Seven of the probes will be drilled to depths of approximately 30 feet bgs and two of the borings will be drilled to approximate depths of 50 feet bgs,
2) Provide materials and construct a maximum of 9 multi-depth gas-monitoring probes.

Gas screening will be conducted by CIWMB personnel using a portable gas detection instrument (GMI 442, capable of measuring methane, carbon dioxide, oxygen and hydrogen sulfide up to 1,000 ppm). Gas sampling also to be conducted by CIWMB personnel will be accomplished using containers (Tedlar Bags) provided by CIWMB's Environmental Laboratory Accreditation Program (ELAP)-certified laboratory contractor. Sample collection and analysis will be conducted in accordance with EPA technical order 15 (TO-15) and ASTM D1946 (Fixed Gases). The CIWMB will use regulatory limits established by both 27 CCR Section 20917 and local Air Quality Management District (AQMD) rules. Field screening will be conducted in accordance with the gas sampling and analysis procedures.

2.2 PROJECT TASKS

2.2.1 Office Investigation Tasks (CIWMB):

a) Review historical aerial photographs to determine, to the extent possible, the aerial (horizontal) extent of the landfill and the location of the landfill with respect to on-site structures,

b) Review previously prepared site investigation reports, paying particular attention to information associated with previously constructed gas monitoring wells and landfill gas data; and summarize the previous data,

c) Review as-built drawings and/or construction plans for the on-site structures, specifically construction details for the foundation, typical penetration details, and specifications for barrier membrane material and placement,

d) Review as-built drawings or construction plans for the gas monitoring system to include monitoring well typical details,

e) Review the Waste Discharge Requirements (WDRs) issued by the RWQCB,

f) Review groundwater monitoring,

g) Review the property Title and Deed search to obtain Assessor Parcel Number, Parcel Map prior to and after development, and property owners,

h) Prepare this work plan.

2.2.2 Phase II Gas Investigation Tasks:

a. CIWMB staff will determine gas monitoring probe and sample locations (Fig. 3),

b. CIWMB staff will arrange with the property owners and provide access to the each property where gas monitoring probe installations are proposed to be installed,

c. CIWMB staff will obtain approved monitoring well permits from the Sacramento County Environmental Management Department (SCEMD),

d. CIWMB staff will be responsible for marking the proposed boring locations in the field. N&M personnel will coordinate the process of evaluating the potential presence of subsurface utilities in areas around proposed borings,

e. The N&M project manager will coordinate drilling and gas monitoring well construction activities and oversee operations,

f. The N&M geologist will collect relatively undisturbed soil samples at approximately 5-foot depth intervals and log these samples and the drill cuttings on the boring logs,

g. N&M staff will direct and oversee the installation of a maximum of 9 multi-level gas-monitoring probes in general accordance with the specifications described in further section, see Figure 2,

h. N&M staff will prepare and provide the CIWMB with as-built schematics for each of the newly constructed gas monitoring wells, as well as boring logs, daily field reports, and photographs. As-built well construction diagrams will indicate probe depths, types and depths of backfill materials including types of filter pack, thickness and material used for seals, size and depth intervals of probe perforations, and description of any shutoff valves or covers. See a typical multi-level monitoring well, Figure 2,

i. When possible, during drilling, CIWMB staff will screen and sample for landfill gas in boreholes according to the gas sampling procedures described in further section,

j. CIWMB staff will be responsible for all the gas-sampling procedures (i.e. sampling, labeling, preserving, decontamination, packaging and shipping). Collected samples will be analyzed for typical landfill gas constituents such as methane, carbon dioxide, nitrogen and oxygen (Fixed Gases, Method ASTM D

1946). Determination of Volatile Organic Compounds (VOCs) will be analyzed including trichloroethylene, perchloroethylene, dichloromethane, tetrachloroethane, benzene, toluene, xylene, and ethyl benzene (TO – 15),

k. Analysis of gas samples will be performed by CIWMB's contract laboratory, ExcelChem Inc.,

l. Upon receipt of laboratory analysis reports for collected samples, CIWMB will compile and correlate gas constituent data and prepare a report summarizing the results. CIWMB will also provide a comparison of the results to regulatory thresholds and provide recommendations for remedial measures required to obtain compliance with applicable regulations,

m. Independent from well borehole landfill gas sampling, authoritative screening and sampling will be conducted by CIWMB at previously constructed gas monitoring wells, cracked foundations, utility vaults and sub floors, as described in further sections,

n. The Sacramento LEA will establish a gas-monitoring program for up to 24 months to be conducted by the landowners. Since landfill gas production typically follows a temporal cycle (normally associated with local hydrologic conditions), data collected from the new gas monitoring wells should be reported to the Sacramento LEA to be analyzed and to determine peak gas production characteristics,

o. CIWMB staff will identify and obtain approvals to dispose of drill cuttings (and fluids) at an approved landfill. Ninyo & Moore will utilize the drilling subcontractor to move the drill cuttings (and fluids) from each of the gas monitoring probe installation locations to the CIWMB-specified landfill.

p. The CIWMB will sample and analyze the drill cuttings prior to disposal at the specified landfill for the following constituents: CAM-17 metals, BTEX/TPH as gasoline, Organochlorine Pesticides, PCB's, and semi-volatiles.

3. MONITORING WELL INSTALLATION

3.1 DRILLING PROCEDURES

The landfill gas monitoring wells will be drilled and constructed by PC Exploration Inc., a bonded, C-57-licensed, drilling contractor with the appropriate current certificates, experience, and training. Borings will be drilled using 8-3/4-inch diameter, hollow-stem, continuous-flight auger. Soil samples will be collected from each monitoring well boring at approximately 5-foot intervals to the total depths drilled, between approximately 30 to 50 feet bgs.

Soil samples will be collected with a standard penetration test sampler. The sampler will be driven approximately 18 inches in advance of the hollow-stem auger by a 140-pound hammer falling 30 inches. Upon retrieving the sampler from the borehole, the sampler will be opened and logged. The borings will be continuously logged by or under the direct supervision of the N&M registered geologist. Soil cuttings will be extruded onto Visqueen plastic sheeting, and at the end of each day, the drilling subcontractor will move these cuttings (and fluids) to the CIWMB-approved landfill.

3.2 WELL CONSTRUCTION

The proposed landfill gas monitoring wells will be installed pursuant to CCR Title 27, Section 20925 specifications:

a. The wells will be installed around the landfill perimeter but not within the refuse. If during the drilling process waste is encountered in a well borehole, the recommended course of action will be discussed with CIWMB personnel. If only a minimal amount, several feet or less of refuse is encountered, the borehole will be advanced and the well constructed. If refuse is encountered in the first few feet of drilling, the borehole will be abandoned by backfilling and the well will be relocated, outward of suspected buried wastes,

b. The maximum depth of the boreholes is anticipated to be 30 to 50 feet bgs based on review of previously prepared reports and documents. The actual borehole depths will generally correspond to the maximum depth of the waste in each area.

The number and depths of monitoring probes to be installed in each of the borings will be based on actual field conditions; however, will generally be as follows:

<u>For gas monitoring wells to depths of approximately 30-50 feet bgs:</u>

a. A shallow probe will be installed at depths of 5 to 10 feet bgs,
b. An intermediate probe will be installed at or near half of the depth of the waste, approximately 25 feet bgs,
c. A deep probe will be installed at or near the maximum depth of the waste, approximately 50 feet bgs.

<u>For gas monitoring wells to depths of less than 30 feet bgs:</u>

a. A shallow probe will be installed at depths of 5 to 10 feet bgs,
b. A deep probe will be installed at or near the maximum depth of the waste, approximately 30 feet bgs.

In addition, the probes will be installed above the permanent low seasonal water table depth, above and below perched ground water, and above bedrock.

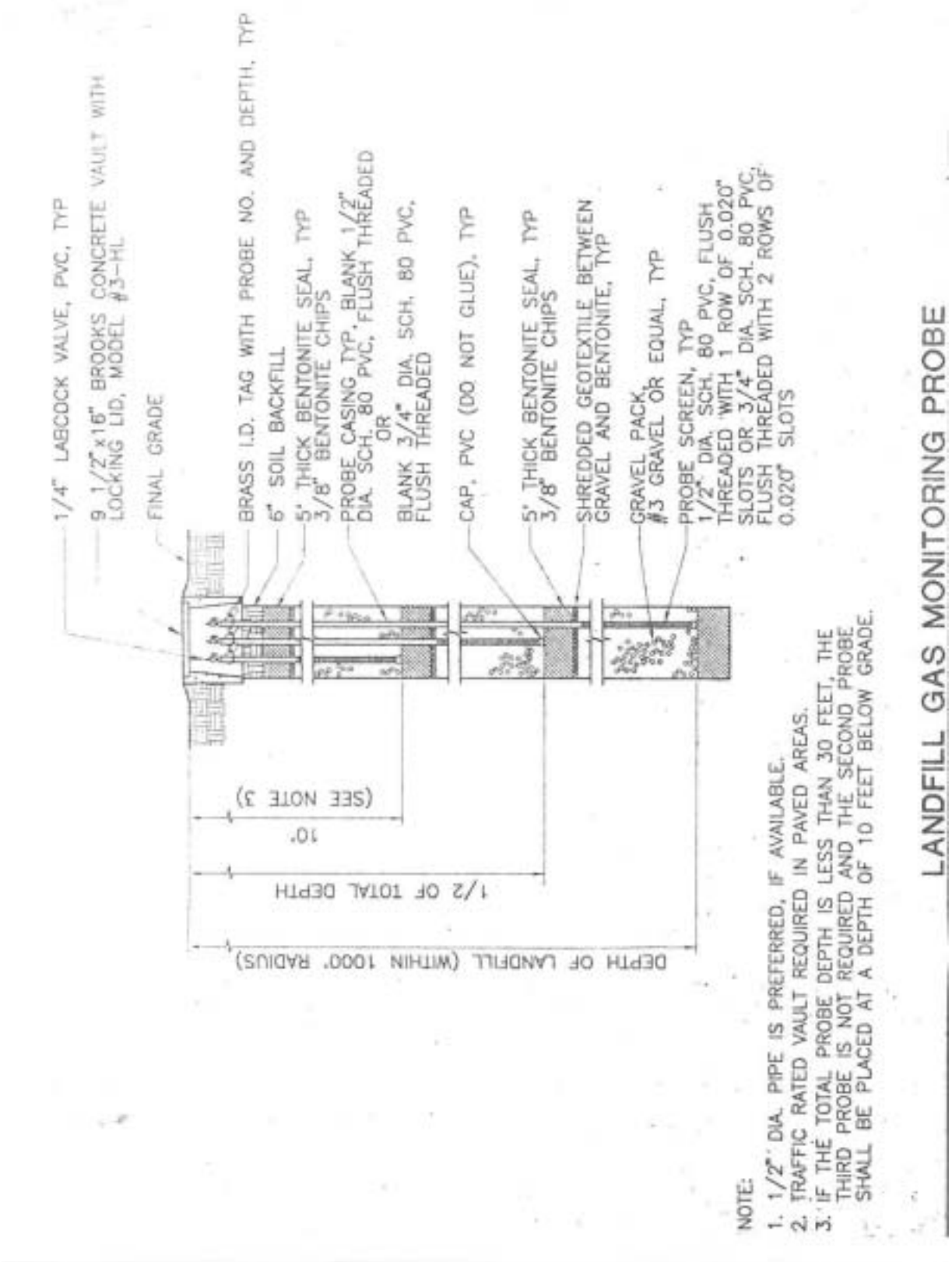


FIGURE 2

California Integrated Waste Management Board Permitting & Enforcement (Closed Illegal and Abandoned Sites Unit)	
Prepared By: AMC Date: 7/15/2002	**Typical Gas Monitoring Probe** 14th Avenue Landfill Sacramento, CA

3.2.1 Required Gas Monitoring Program

After the completion of new gas monitoring wells, methane concentrations in each well will be measured through an established program that will be maintained by the landowners. Methane concentrations will be recorded using a gas detector.

Initially, CIWMB will recommend quarterly monitoring of the new gas wells followed by a report presented to the SCEMD for analysis of the gas migration potential. At least two or three samples from different gas monitoring wells will be collected for laboratory analysis on an annual schedule to verify the accuracy of the gas detector used for monitoring landfill gas concentrations.

3.3 PROPOSED GAS MONITORING WELL LOCATIONS

Gas monitoring wells will be constructed at locations where historically elevated methane gas concentrations have been recorded in the previously constructed gas monitoring wells. The selected gas monitoring well locations are generally as follows and are assumed to be located outside of the assumed waste footprint (Figure 3).

(W1) Sky King Properties: (50 feet bgs, triple probe construction).
One well to the northeast of the building located at 3600 Power Inn Road, Grid O3.

(W2) Cozzitorto Property: (50 feet bgs, triple probe construction).
One well to the southwest of the property located at 3800 Power Inn Road, avoiding paved areas, as possible Grid O6.

(W3) Sac. Ford Tractor: (30 feet bgs, triple probe construction).
One well to the north of the building located at the corner of 14th Avenue and Power Inn Road, Grid O8.

(W4) Laurelwood Investors: (30 feet bgs, triple probe construction)
One well to the north of the building located at 7935 14th Avenue, Grid M8.

(W5) DRA Corporation: (30 feet bgs, triple probe construction).
One well to the north of the building located at 7901 14th Avenue, Grid K8.

(W6) William Property: (30 feet bgs, triple probe construction).
One well to the south of the building located at 7601 14th Avenue, Grid F8.

(W7) Malher Family Trust: (30 feet bgs, triple probe construction).
One well to the northeast of the building located at 7571 14th Avenue, Grid D8.

(W8) Curtis Roof. Property: (30 feet bgs, triple probe construction).
One well between the properties of Curtis Roofing and 14th Avenue Associates located at 7475 14th Avenue, Grid B8.

(W9) Ramona Holdings: (30 feet bgs, triple probe construction).
One well to the northeast of the building located at 7832 Ramon Avenue, Grid K3.

Proposed Monitoring Well Locations Map

(W1) Sky King Properties:
(50 feet bgs, triple probe construction).
One well to the northeast of the building located at 3600 Power Inn Road, Grid O3.

(W2) Sacramento Ford Tractor:
(50 feet bgs, triple probe construction).
One well to the southeast of the property located at 3850 14th ave, Grid O6.

(W3) Sac. Ford Tractor:
(30 feet bgs, triple probe construction).
One well to the north of the building located at the corner of 14th Avenue and Power Inn Road, Grid O8.

(W4) Laurelwood Investors:
(30 feet bgs, triple probe construction)
One well to the southeastof the building located at 7935 14th Avenue, Grid M8.

(W5) Pacific Coast Waste Paper:
(30 feet bgs, triple probe construction).
One well to the north of the building located at 7475 14th Avenue, Grid K8.

(W6) William Property:
(30 feet bgs, triple probe construction).
One well to the south of the building located at 7601 14th Avenue, Grid F8.

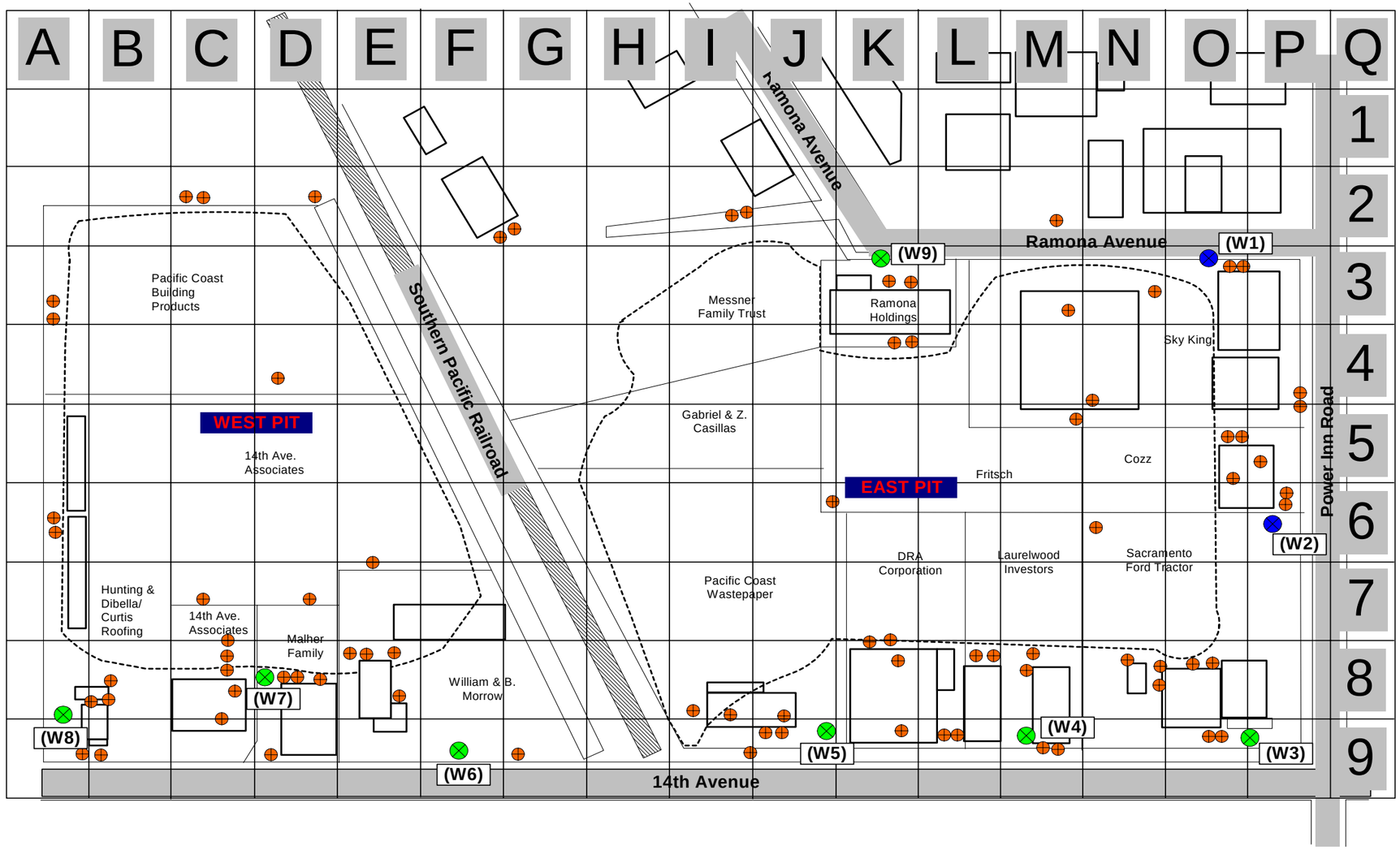
(W7) Malher Family Trust:
(30 feet bgs, triple probe construction).
One well to the northeast of the building located at 7571 14th Avenue, Grid D8.

(W8) Curtis Roof. Property:
(30 feet bgs, triple probe construction).
One well to the east of the property located at 7475 14th Avenue, Grid B8.

(W9) Cityof Sacramento:
(30 feet bgs, triple probe construction).
One well to the north of the building located at 7832 Ramona Avenue, Grid K3.

0 150 300 450

Scale in Feet



Landfill Boundaries

Property Boundaries

Existing Gas Monitoring Wells

Proposed New Gas Monitoring Wells

50 ft bgs

30 ft bgs

N

Figure 3

California Integrated Waste Management Board
1001 I Street - Sacramento, CA 95814
(Closed Illegal & Abandoned Sites Investigation Unit)

Date: July 15, 2002

Prepared By: CIWMB

Proposed Well Location Map

14th Avenue Landfill - Sacramento, CA

4. GAS SAMPLING PLAN

This gas-sampling plan is intended to document the procedural and analytical requirements for this and subsequent gas sampling events and to characterize areas exceeding regulatory thresholds. This plan was compiled after reviewing the US Environmental Protection Agency's, Region 9, guidance document "Instructions for the One-time Sampling Event Sampling and Analysis Plan" dated March, 1998.

4.1 SAMPLING OVERVIEW

Gas sampling will be conducted at each of the newly constructed gas monitoring wells. Authoritative sampling will be performed at previously constructed gas monitoring wells, and sub floors, (Figure 4). Sampling will be performed by CIWMB, CIA staff.

4.1.1 Sampling Locations

Sampling Gas Monitoring Well Boreholes: If allowed by the drilling method, initial gas screening will be conducted at borings by advancing a gas intake tubing connected to a sampling pump and a Tedlar through the hollow stem auger to a depth between 10-20 feet bgs. Gas collected into the bag will be screened for methane using a gas surveyor (GMI 442). Readings will be logged and further samples will be taken if methane concentration is found to be above 1% by volume.

Authoritative Sampling: Approximately 20 discrete gas samples will be collected by CIWMB staff at the previously established monitoring wells, sub floors where gas screening indicates that methane gas is above 1% by volume, utility vaults, and cracked foundation. The pressure will be measured using a Magnahelic gauge. Sampling locations will be predetermined based on available site information and data. Gas sampling will be conducted initially at locations shown in Figure 4. The authoritative protocol allows the investigator the flexibility to move sampling locations, as necessary, to accommodate unforeseen field conditions.

Gas Samplig Protocol

Sampling Gas Monitoring Well Boreholes:
If allowed by the drilling method, initial gas screening will be conducted at borings by advancing a gas intake tubing connected to a sampling pump and a Tedlar through the hollow stem auger to a depth between 10-20 feet bgs. Gas collected into the bag will be screened for methane using a gas surveyor (GMI 442). Readings will be logged and further samples will be taken if methane concentration is found to be above 1% by volume.

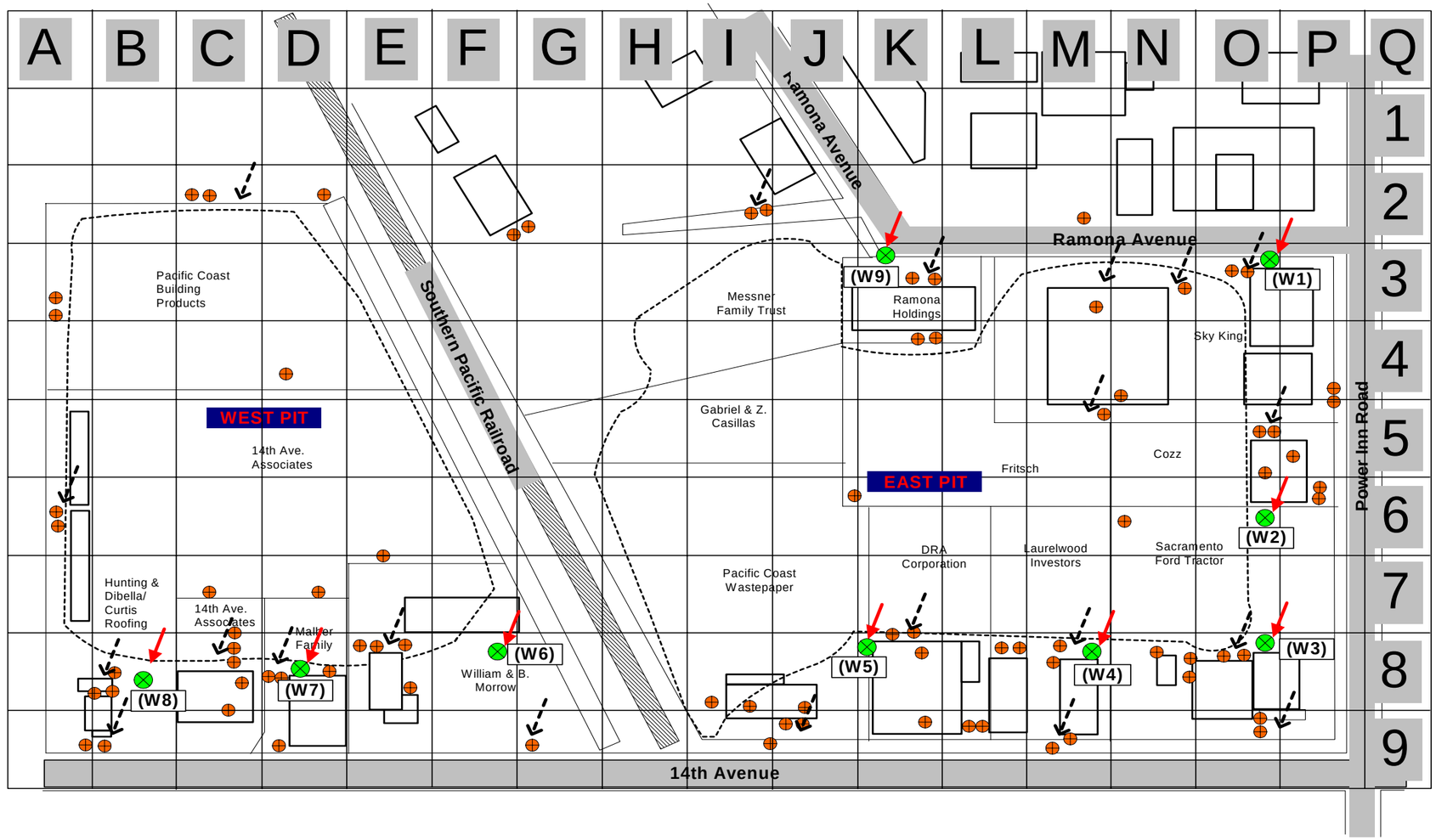
Authoritative Sampling:
Approximately 20 discrete gas samples will be collected by CIWMB staff at the previously established monitoring wells, sub floors where gas screening indicates that methane gas is above 1% by volume, utility vaults, and cracked foundation. The pressure will be measured using a Magnahelic gauge. Sampling locations will be predetermined based on available site information and data. Gas sampling will initially be conducted at locations shown in Figure 4. The authoritative protocol allows the investigator the flexibility to move sampling locations, as necessary, to accommodate unforeseen field conditions.

Notes:

- Grid spacing (150 x 150 ft)

0 150 300 450

Scale in Feet



- Landfill Boundaries
- Property Boundaries
- Existing Gas Monitoring Wells
- Proposed New Gas Monitoring Wells
- Well Boreholes Sampling
- Authoritative Sampling

N

Figure 4

California Integrated Waste Management Board
1001 I Street - Sacramento, CA 95814
(Closed Illegal & Abandoned Sites Investigation Unit)

Date: July 15, 2002

Prepared By: CIWMB

Gas Sampling Location Map

14th Avenue Landfill - Sacramento, CA

4.2 GAS SAMPLING EQUIPMENT

The following equipment and supplies will be provided by the CIWMB and used to perform the gas sampling:

- GMI Gas Detection Instrument
- Tedlar Bags
- Trash Bags
- Bar-Hole Punch
- Temperature Gage
- Pressure Gage (Magnahelic Gage)
- Pneumatic Air Sampling Pump
- Digital Camera
- Gas monitoring data log sheet
- First aid kit
- Chain of custody forms and seals
- Mailing labels and markers
- Log Sheets
- Packing and duct tape
- Tool Kit (screwdriver, wrench, pliers)
- Laptop computer (download data)
- Decontamination equipment (2-½ gallon sprayer, non-phosphate detergent, disposable brush, paper towels, cotton towels, polyethylene sheeting)

4.3 GAS SAMPLING PROCEDURES

Gas samples will be collected using pneumatic air pumps, GMI, Tedlar Bags. All sampling equipment and containers will be decontaminated prior to use.

a. Sampling locations will be screened with a GMI 442 before obtaining a sample for analysis,

b. After each sample is collected, it will be labeled, logged on the chain-of-custody document, sealed, and packed for shipment to laboratory for analytical testing,

c. Each day at the completion of sampling activities, ExcelChem Inc. personnel will provide on site pick up of the collected samples for analyses in accordance with chain-of-custody protocol,

d. CIWMB staff will record gas sampling locations and prepare records of field measurements,

e. If a gas sample exceeds 1% methane by volume, a Tedlar Bag will be used to collect a gas sample for fixed gas and T.O. 15 analysis.

4.4 DECONTAMINATION PROCEDURES

Equipment that comes into contact with landfill gas will be decontaminated in a designated area. Decontamination will consist of operating the sampling equipment with nitrogen or ambient air for 2 minutes to purge residual gas.

4.5 GAS SAMPLE CONTAINERS AND PRESERVATION

Tedlar Bags will be supplied by the analytical testing laboratory and will not require decontamination before sample collection. No preservative will be added to the containers.

4.6 DISPOSAL OF INVESTIGATIVE DERIVED WASTES

In the process of collecting gas samples at the 14th Avenue Landfill, the CIWMB sampling team will generate potentially contaminated investigation-derived waste (IDW) that may include:

- Used personal protective equipment (PPE)
- Disposable sampling equipment

The U.S. EPA's National Contingency Plan requires management of IDW generated during sampling comply with all applicable or relevant and appropriate requirements to the extent practicable. Used PPE and disposable equipment will be double bagged and placed into a municipal refuse dumpster. Any PPE and disposable equipment that may still be operable will be rendered inoperable before disposal. CIWMB staff will identify and obtain approvals to dispose of drill cuttings (and fluids) at an approved landfill. Ninyo & Moore will utilize the drilling subcontractor to move the drill cuttings (and fluids) from each of the gas monitoring probe installation locations to the CIWMB-specified landfill.

If hazardous or radioactive materials are encountered during sample screening activities, appropriate level of notification and response procedures will be implemented in accordance with the Site Specific Health and Safety Plan.

4.7 CONSTITUENTS OF POTENTIAL CONCERN

Gas constituents of potential concern at this site are methane, carbon dioxide, nitrogen, hydrogen sulfide, and trace gases.

4.8 ANALYTICAL TESTING PROGRAM AND ANTICIPATED COSTS

Each sample will be screened for percent combustible gas (calibrated to methane) using a GMI 442. Samples will be analyzed using Method EPA TO-15 for VOCs, and ASTM D1946 for fixed gases.

Based on discussions with ExcelChem Inc. personnel, the following analytical testing costs were provided:

METHOD	PARAMETER	UNIT COST	SAMPLES	COST
EPA TO-15	Total Organics	$250.00	28	$7000.00
ASTM D1946	Fixed Gases	$140.00	28	$3920.00
			Total	**$10,920.00**

4.9 FIELD QUALITY CONTROL

One field duplicate gas sample will be collected into a separate sample container simultaneously with a standard sample from the same source under identical conditions. The duplicate sample will be managed independently of its counterpart in order to assess laboratory performance through comparison of the results. The duplicate gas sample will be collected from a random location that demonstrates elevated gas concentrations based on field screening results.

4.10 LABORATORY QUALITY CONTROL

The analytical laboratory will perform Quality Control (QC). The QC will include project specific QC, method blank results, laboratory control spike, and matrix spike results.

1. Project Specific QC – No project specific QC has been requested by the CIWMB.

2. Method Blank – A method blank is a laboratory-generated sample that assesses the degree to which laboratory operations and procedures may cause false-positive analytical results. The method blank analytical results associated with the samples will be included with the analytical results.

3. Laboratory Control Spike – A Laboratory Control Spike (LCS) is a sample that is spiked with known analyte concentrations, and analyzed at approximately 10 percent of the sample load in order to establish method-specific control limits. The LCS results associated with the CIWMB gas samples will be included with the analytical report.

4. Matrix Spike – A matrix spike is a sample that is spiked with known analyte concentrations and analyzed at approximately 10 percent of the sample load in order to establish method-specific control limits. The matrix spike results associated with CIWMB samples will be included with the analytical report.

5. Accuracy – Accuracy will be measured by percent recovery as defined by:

$$\% \text{ Recovery} = \frac{(\text{measured concentration}) \times 100}{(\text{Actual concentration})}$$

5. DOCUMENTING AND REPORTING

5.1 FIELD NOTES

At a minimum, the following gas sample information will be chronologically recorded on the daily field reports to document the vital project and sample information:

- Sample identification, location, and description,
- Site or sample area sketch showing sample location and measured distances to specific features such as on site structures,
- Sampler's name(s),
- Date and time each boring is completed and each monitoring well is constructed,
- Date and time of sample collection,
- Type of gas sample collected,
- Type of sampling equipment used,
- Field instrument reading, if applicable,
- Field observations and details related to analysis or integrity of samples (e.g., weather conditions, noticeable odors, colors, etc.),
- Preliminary sample descriptions,
- Gas sample identification and explanatory code, and
- Name of recipient laboratory.

In addition to the sampling information, the following specific information will also be recorded in the daily field reports:

- Project team members and their responsibilities, visitors to the site, as applicable,
- Arrival and departure times of all personnel associated with and/or visiting the site,
- Deviations from the sampling plan
  Level of health and safety protection

5.2 PHOTOGRAPHIC DOCUMENTATION

Photographs will be taken to document drilling, construction of the gas monitoring wells, and gas sampling procedures at each gas monitoring well. Photographs will also document areas surrounding the monitoring wells. The photographs will verify and supplement information recorded on the daily field reports. Each photograph will be recorded in the daily field reports and include information regarding the subject, and the approximate time, date, and location of the photograph.

5.3 LANDFILL GAS SAMPLE LABELING

Landfill gas samples will be labeled in a clear, precise, and thorough manner to ensure proper identification for tracking in the laboratory. Each sample will include a unique sample identification/number, general sample location information, sample collection date and time, sample type, and the requested analytical test methods.

5.4 CHAIN-OF-CUSTODY

A chain-of-custody record will accompany each sample shipment. Shipped samples will have a custody seal placed across the lid of each sample container. All custody seals will be signed and dated by the sampler.

5.5 PACKING AND SHIPMENT

Sample containers will be placed in a strong-outside shipping container. If ice is used to cool the samples, the ice will be packed in a double “Ziploc” bag. Special care will be provided to secure and prevent damage to the sample containers.

5.6 REPORTING

Following receipt of the analytical data, CIWMB staff will evaluate and summarize project data/information onto appropriate figures and tables. CIWMB staff will prepare a landfill gas sampling report providing descriptions of field procedure/methodologies implemented, a summary of landfill gas concentrations and migration, and discussion of the analytical results. The CIWMB anticipates submitting the sampling report to the LEA within 60 days after receipt of the analytical results.

Approvals

PREPARED BY:

Abel Martinez-Cerrato (Waste Management Engineer) — 7/18/02 Date

PEER REVIEWED BY:

Dawn Owen (Integrated Waste Management Specialist) — 7/16/02 Date

SENIOR SUPERVISOR:

Glenn Young, PE
(Closed Illegal and Abandoned Site Investigation Unit) — 7/16/02 Date